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THE MUSHROOM GROWERS'
ASSOCIATION

MGA
BULLETIN

DECEMBER, 1955 · NUMBER 72

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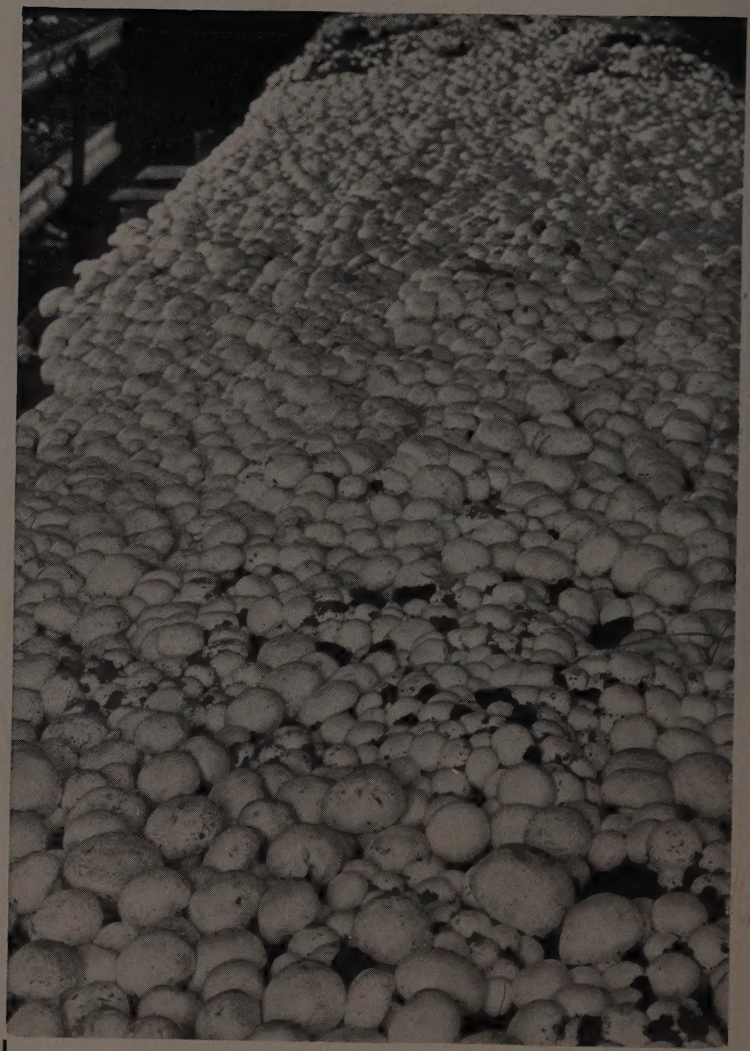


"YOU CAN'T KEEP A GOOD SPAWN DOWN"

PINKERTON'S PROLIFIC

PURE CULTURE SPAWN

The
MGA BULLETIN

DECEMBER, 1955
NUMBER 72

EDITORIAL

BRAVE EXPERIMENT

A few days ago, in somewhat splendid surroundings, the last sad rites over the body of the now liquidated Mushroom Research Association were performed with due ceremony, but let it be said that this experiment died bravely for, in death, it handed over no less than £1,500 worth of equipment to the new Glasshouse Research Institute at Littlehampton and a cheque for £1,105 in a final flourish to keep mushroom research going. As Fred. C. Atkins pointed out in handing over the cheque to Mr. T. Ainslie Robertson (Chairman of the Institute), in life no less than £25,000 was subscribed to the MRA "to demonstrate that our need for research was genuine."

It was in 1945 that a small band of progressive growers got together and formed the Mushroom Research Association Ltd., which began work at Yaxley the following year. For the first three years little was known of the extent or the findings of that work, outside the company subscribers, but then, for as little as £15 per year, growers could subscribe and could avail themselves of the facilities offered. As the high war-time prices of mushrooms declined so subscriptions fell and in 1949 the MGA took over the MRA with a 50 per cent. grant from the Ministry, a grant which had to be increased to 60 per cent. in 1950, 70 per cent. in 1952, and up to 75 per cent. in 1953, and, for the final nine months, the Ministry was the sole support.

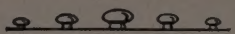
So it comes about that, when other countries are just making a beginning into the task of sponsoring their own research, we here in the British Isles have seen our own fade and die.

In the light of what transpired the MRA, I suggest, was badly conceived in that no plans were made for additional growing houses and staff to produce mushrooms commercially and thus provide much needed finance for research, welding the whole into a growing concern. If ever research is again sponsored by the growers here, this fact may well be borne in mind—and research of a practical nature is likely to be sorely needed by the whole industry.

It is not without some anxiety that eyes are now turned towards

Littlehampton and this anxiety is by no means stilled by the fact that, after the somewhat hurried and premature closing of Yaxley by the Ministry, little if anything has since been done in the matter of mushroom research, and more than a year has elapsed since that Yaxley closure.

W.R.A.



EXECUTIVE COMMITTEE

At a meeting of the Executive Committee held at The Bedford Corner Hotel, London, on Thursday, 10th November, presided over by Mr. G. W. Baker (Chairman), Mr. F. C. Atkins voiced appreciation of the services to the industry by Mr. J. Stewart-Wood (Aylesbury), who did not seek re-election to the Committee. Mr. Atkins said that Mr. Stewart-Wood had an exceptional record of service and, over a period of ten years, had only missed two meetings. The Secretary was instructed to write a letter of appreciation to Mr. Stewart-Wood.

The Chairman, referring to the annual exhibition at Brighton, said this had been quite successful and the trade had expressed satisfaction. The exhibitors had also requested that the 1956 exhibition should remain in the South. All the exhibition accounts had not yet been submitted but it appeared that expenditure and income " might just about balance."

A sub-committee to investigate the marketing of matured compost was set up, under the chairmanship of Mr. W. A. B. Harding (Kent). Publicity was again discussed to some length and, for the time being the Committee agreed that the existing scheme of 1d. per carton should be continued with an all out effort being made to make the scheme far more efficient, pending further discussions on the proposed 6d. per carton at the annual general meeting. Progress regarding participation in the 1956 British Food Fair at Olympia was reported, and it was agreed that the Association should exhibit with the comprehensive horticultural exhibit being organised by the NFU Publicity organisation. Among other matters it was agreed to again press the NFU Glasshouse Committee to take every possible step to see that mushrooms were included in the Annual Quarterly Returns in order that the present production of mushrooms in this country could be reasonably assessed.

It was decided to investigate the possibilities of holding the 1956 exhibition at either Eastbourne or Hastings.

Earlier, the Chairman had warmly welcomed those members who had been re-elected to the committee and also the two new members, Mr. J. A. Linfield and Mr. Stanley Middlebrook.

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CONTROLLING MUSHROOM DISEASES WITH CHLORINATED WATER

By T. T. AYERS AND EDMUND B. LAMBERT
(*U.S. Dept. of Agriculture Research Service*)

SUMMARY: Experiments have shown that Bacterial Blotch, Soft Rot of Pinheads, Verticillium Spot, and Mycogone diseases of mushrooms may be controlled by chlorinating the water used for wetting the beds. The recommended strength is 50 to 200 p.p.m. of available chlorine. The first application should be delayed until the mushrooms begin to appear on the beds. When this procedure is followed, several diseases are materially reduced with no detrimental effect on the yield or quality of the mushrooms and no health hazard to consumers or men working in the mushroom houses.

INTRODUCTION

Chlorinated water has been used for many years for disinfecting mushroom casing soil and as a fungicide and bactericide in and around mushroom houses. For at least 25 years mushroom growers in central France have been using a solution of sodium hypochlorite (Javel water) for sterilizing casing soil (2). It also has been an accepted practice for growers both in Europe and in the United States to make local applications of hypochlorite powder or strong hypochlorite solutions to eradicate outbreaks of the mildew and bacterial blotch diseases of mushrooms (3, 5, 7). Until quite recently, however, it has been assumed that chlorinated water would be harmful if applied to producing mushroom beds in solutions strong enough to control disease organisms. The first indication that this might be a false assumption came from the experiments described by Bulloch in 1950 (4). In these experiments he was able to control *Acremonium* sp. with a hypochlorite solution which he pointed out caused " hardly any discolouration " of the mushroom tissue.

The studies described here were made to systematically explore the feasibility of controlling several soil-borne disease organisms by watering the beds with chlorinated water during the entire cropping period.

In the winter of 1952, we reported[1] the results of our first season's tests on the control of Blotch disease and also urged a few growers in eastern Pennsylvania to test chlorinated water in commercial houses. The favourable results obtained in our experiments and in tests made in commercial houses have led to the extensive use of chlorinated water

[1]Paper was given to the Potomac Section, American Phytopathological Society.

in the past two years as a part of the routine growing procedure in commercial houses in eastern Pennsylvania and Delaware. The purpose of this paper is to describe the results of our experiments, outline the experience of commercial growers and discuss the advantages and limitations of using chlorinated water in commercial practice.

EXPERIMENTAL PROCEDURE

Most of the experiments consisted of applying chlorinated water of different strengths to trays which were previously sprayed with inoculum from cultures of the different pathogens and to other trays prepared for yield tests. The water was chlorinated by dissolving BK powder or mixing solutions of sodium hypochlorite in water to bring the concentration of available chlorine to the desired number of parts per million. The solutions we used were made up in accordance with the manufacturer's directions. The concentration of chlorine was checked by the " Ortho Tolidine " method. " La Motte Chlorine Test Papers " were used for making rapid rough approximations of chlorine concentrations. They are expressed as " available chlorine " to conform with standard methods of examination of water and sewage (1). When these solutions were tested with the " Ortho Tolidine " method values of " active chlorine " were obtained which were one-half of the " available chlorine." This is an important point to bear in mind since a solution testing 200 p.p.m. "active chlorine" with the Ortho Tolidine method would actually contain 400 p.p.m. "available chlorine." The reason for this difference is clearly explained by Rudolph and Levine (6).

Chlorinated water was applied to the beds simply by substituting it for the tap water customarily used for maintaining moisture in the casing soil.

Yield tests were made in trays arranged in a randomized block design. Each tray contained 3½ square feet of surface. There were 6 randomized blocks with from 5 to 12 treatments in each block depending on the experiment. In filling the trays sufficient compost to fill all of the trays in each block was removed from the main heap and mixed thoroughly before filling to insure that the compost in every tray was as nearly alike as possible. The recorded yields are the weights of pulled mushrooms less 20% to account for the stubs that are normally trimmed off.

To insure a plentiful supply of the different diseases, several groups of six boxes were sprayed with spore suspensions of different pathogens. The following organisms were used: *Pseudomonas tolaasi* Paine, *Verticillium* sp., *Mycogone perniciosa* Mag., *Dactylium dendroides* Bull. and *Geotrichum* sp. The organism causing Bacterial Blotch was applied after the mushrooms developed on the bed. All other organisms were applied to the soil either before casing or immediately after casing.

DISEASE CONTROL EXPERIMENTS

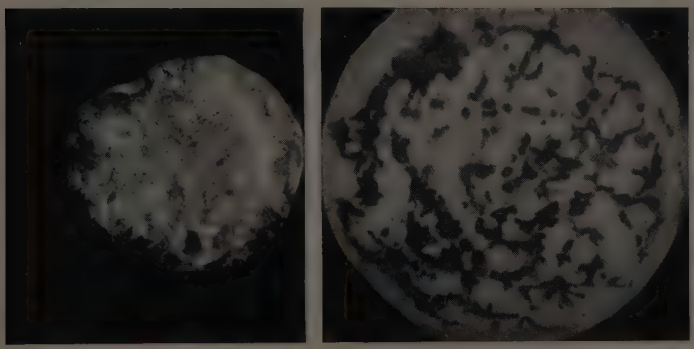
Bacterial Blotch Disease. Our first experiments were made in 1951 to test the control of Bacterial Blotch by concentrations of available chlorine similar to those used to control bacteria in the dairy industry.

A high incidence of the disease was obtained on 24 trays by spraying with a bacterial suspension and by maintaining a high humidity in the air with live steam. Before the treatment was applied nearly two-thirds of the mushrooms were blemished. Chlorine solutions were applied in strengths of 33, 100 and 200 p.p.m. of available chlorine. The diseased condition gradually disappeared with successive waterings until after several waterings the classes of disease severity were distributed as indicated in Table 1. The manner in which the disease was cleared up

Table 1. Controlling bacterial blotch with different levels of available chlorine.

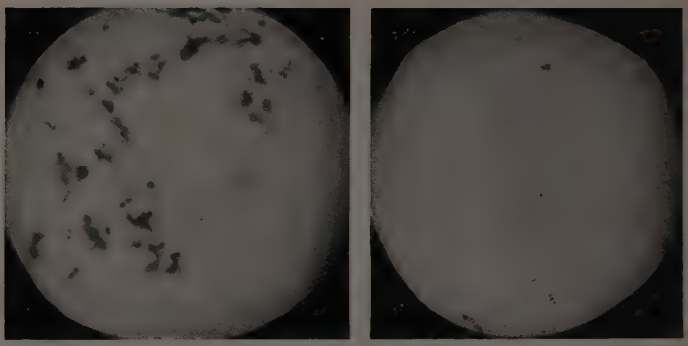
Level of Chlorine	Caps Examined	Classes of cap discolouration			
		Severe %	Moderate %	Light %	None %
Control	1064	34	17	15	34
33 p.p.m.	963	4	6	11	78
100 p.p.m.	939	1	2	6	90
200 p.p.m.	791	1	1	5	93

suggested that it was being controlled by eliminating the blotch organism in the soil rather than by protecting the surface of the mushroom caps. In making up Table 1 four classes of infection are indicated. Examples of these are shown in Figure 1. It is evident that blotch may



Severe Moderate

be effectively cleared up with chlorinated water even though the incidence of disease before treatment is much more severe than ordinarily encountered in commercial houses. Subsequent experience has corroborated this conclusion.



Light None

Figure 1. Mushroom caps with bacterial blotch typical of the infection classes indicated in Table 1.

Soft Rot of Pinhead Mushrooms. After each flush of mushrooms is picked off, many of the remaining small mushrooms (pinheads) die. This dying of pinheads is due to the breaking of their channels for food translocation in the soil during picking and is inevitable. The presence of these numerous dying mushrooms on the bed poses a problem in sanitation. They are usually removed by careful hand picking. If they are not removed they may become putrid from bacterial soft rot and reduce the subsequent yield of healthy mushrooms in the affected area.

When the beds are watered with chlorinated water the dead pinheads shrink to wrinkled mummies without rotting. In this condition they are harmless and need not be removed by laborious hand picking.

Pit Disease. We have not been successful in our efforts to reproduce typical " Pit " symptoms uncomplicated by Blotch Disease symptoms by spraying the beds with bacterial cultures. Wood (9,10), who has perhaps done more work with this disease than anyone else, described similar results as follows: " Under experimental inoculation conditions it has not yet been possible to induce an effect where, instead of Bacterial Rot symptoms supervening, the effect of the soft rot bacteria attack is to cause localized rotting areas, viz., ' pitting '."

In view of the difficulties encountered in experimentally reproducing the Pit Disease, it is necessary to rely on evidence of control obtained in growers' houses where the incidence of typical Pit Disease has been rather high. Several growers have informed the writers that Pit Disease has been reduced or eliminated in their houses through the use of chlorinated water. The experience of a grower in Miami, Florida, may be cited as an example. One of the authors visited this plant in February, 1953. Typical Pit Disease was prevalent at that time and was largely uncomplicated by Bacterial Blotch. It was estimated that nearly 50%

of the mushrooms were pitted. The application of chlorinated water (100 p.p.m.) was suggested as an experimental control measure. About three weeks later this grower reported that the " Pits " were reduced to less than 5% of the mushrooms on the bed.

Verticillium Disease. Six trays were inoculated with a spore suspension shortly after casing time. Beginning on the same day, three of the trays received water with no chlorine and three a solution with 100 p.p.m. available chlorine. A few spotted mushrooms appeared in the non-treated trays during the second flush. In successive flushes the percentage of spotted mushrooms increased and some of the mushrooms became deformed. Infection became so heavy that in later flushes at least half of the mushrooms were spotted (Figure 2). Most of these

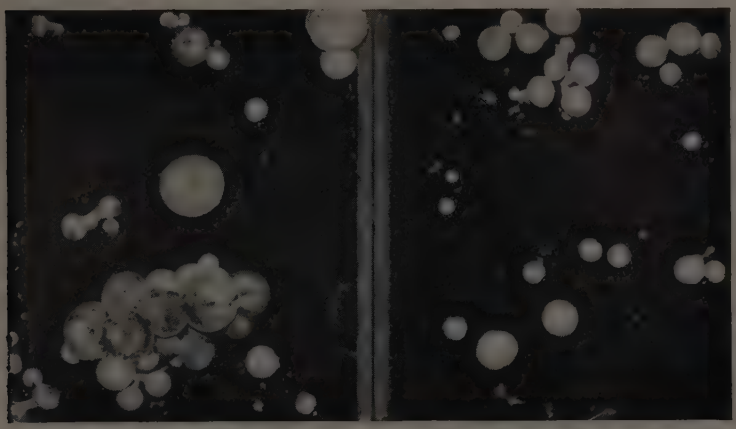


Figure 2. *Verticillium* spot disease on untreated (left) and treated (right) trays of mushrooms.

spotted mushrooms were unsaleable. None of the mushrooms in the treated trays were spotted until the later flushes when a few mushrooms appeared to be spotted from water splashing from nearby untreated trays. The control was clear-cut and decisive. Furthermore, production in the untreated trays practically ceased after four or five breaks as the result of infection and stunting of the young mushrooms by the *Verticillium* mycelium in the soil. In contrast, the treated trays continued to produce clean, normal, healthy mushrooms.

Mycogone Disease (Bubbles). Experiments were made on the control of the Bubbles Disease similar to those outlined for the *Verticillium* disease. Here, again, the trays were inoculated with a suspension of *Mycogone* spores shortly after casing and the treatment with chlorinated water was begun immediately. The infestation was so successful that after three breaks more than half the mushrooms of the untreated trays were parasitized and partially or wholly deformed by

Mycogone fungus. The amount of disease in untreated trays is shown in Figure 3. No " bubbles " appeared during the first 4 or 5 breaks in

Figure 3. Severity of bubbles disease in control trays.

the treated trays. A few " bubbles " appeared in these trays at the end of the crop, but at that time the surface of the beds dried more slowly and we were not watering oftener than once in a week or 10 days. It is our opinion that these " bubbles " were caused by spreading the fungus from the untreated trays as a result of picking and trashing between waterings.

After the untreated trays became covered with " bubbles," an attempt was made to eradicate the infection in two of the trays by applying chlorinated water (100 PPM). The relative percentage of " bubbles " to clean mushrooms was considerably reduced but we did not succeed in bringing these trays back to a disease-free condition similar to that of the treated trays. We attributed our failure to the fact that the soil was quite moist at the time we started using chlorinated water and in all probability the chlorine was highly diluted by the water already present in the soil.

In commercial growing it is not anticipated that chlorinated water will replace soil sterilization or control a well established infestation of bubbles. On the other hand, if used early enough and consistently throughout the crop it should significantly delay the appearance of a heavy infestation in a manner similar to that attained from the use of zineb.

Mildew Disease. Probably because of a low humidity in the house early in the spring, this disease did not appear, in spite of our inoculations, until about the sixth break. Our tests were inconsistent and inconclusive but suggest that 100 p.p.m. available chlorine will not eliminate mildew. Stronger solutions were not tried.

Acremonium Disease. This disease has not yet been recognized in the United States. Bulloch (4) described its control in England with 0·1% solution of sodium hypochlorite. From the results of his experiments it seems probable that the *Acremonium* disease is fully as amenable to control with chlorinated water as the *Verticillium* spot disease which it so closely resembles in symptoms.

Lipstick Disease. During the past two years we have watered most of the trays in our pilot plant with water containing 100 p.p.m. available chlorine. In spite of this treatment *Geotrichum* sp. has appeared in our

growing rooms before the end of each crop and in some trays fully invaded the soil. There was some suggestion that chlorinated water may have slightly reduced the rate of spread of *Geotrichum* but it clearly was not effective enough to be considered a satisfactory control measure.

Other Diseases. Evidence is as yet lacking on the effect of chlorinated water in controlling soil-inhabiting organisms such as: *Fusarium* sp., *Myceliophthora* sp., *Trichoderma* sp., *Oedocephalum* sp., *Botrytis* sp., and the unknown organism causing Mummy disease.

EXPERIENCE OF COMMERCIAL GROWERS

As mentioned previously, several commercial growers were asked about three years ago to test chlorinated water on an experimental basis. On the basis of the experience gained in these tests many growers in the eastern Pennsylvania and Delaware mushroom-growing area are now using chlorinated water exclusively. A concensus of these growers would seem to be that chlorinated water helps them to prolong the harvest of clean mushrooms and delays the appearance of diseases. The cost for the materials is comparatively low and is not considered to be a serious limitation.

EFFECT ON APPEARANCE AND FLAVOUR

After learning that chlorinated water would control disease, we were confronted with the question of how this procedure would affect quality and yields. Experiments soon showed that water chlorinated to 100 or 200 p.p.m. has no detrimental effect on the appearance of the white variety of mushrooms on the beds. On the other hand, tests with increasing amounts of chlorine in the water indicate that excessive chlorination will cause a yellowing of the surface of the mushrooms in one or two hours after the water has been applied. The minimum concentration causing discolouration is about 300 p.p.m. of available chlorine. The margin of safety between the 100 p.p.m. available chlorine used for disease control and the concentration at which tanning begins is apparently sufficient for practical purposes in commercial culture. Mild yellowing is not serious and growers often determine the chlorine concentration they want to use by increasing the concentration until slight discolouring occurs, then " backing off " to a safe concentration. In experiments where the available chlorine was carefully checked we have never seen yellowing caused by 200 p.p.m. or less.

We have been cooking and eating " white " mushrooms from our experimental beds, with and without treatment, for four years and have never noticed any off-colour or off-flavour in cooked mushrooms that had been treated at the rate of 100 p.p.m. During the past three years, thousands of pounds of the " white variety " of mushrooms have been picked from commercial beds treated with chlorinated water and subsequently sold on the fresh market or to canners who process in salt brine. We do not know of a single complaint from the purchaser of these mushrooms. Also, careful comparative tests made by the Quality Control Department of the Brandywine Mushroom Company have shown clearly that mushrooms from beds treated with chlorinated water do not have an off-flavour or off-colour when processed in the usual

brine pack.

We have not watered beds of the " brown " variety with chlorinated water but understand from the experience of others that this variety reacts somewhat differently than the whites. The Grocery Store Products Company, West Chester, Pa., grows the brown variety exclusively on a very large scale and processes them into a product known as " Broiled in Butter." Mr. J. C. Bovenkirk, their Director of Research, wrote us regarding the Company's experience with browns as follows:

> " I have noted that the cream pigmentation has a yellow cast immediately after the chlorine water is applied; however, it is only a temporary effect. The mushroom regains its usual colour in a few hours. We ran an entire crop using 100 p.p.m. chlorine water on 30 houses. We used only chlorine water. The appearance of the mushrooms was normal in colour, shape and size after processing. We have received no complaints from consumers on " off-flavour " or lack of flavour. Our Quality Control Department which checks daily the canned pack found the chlorine treated to be the same in every respect as the untreated."

The most discouraging news regarding the effect of chlorinated water on quality is the experience of the Butler County Mushroom Farm that grows mushrooms extensively in caverns and prefers a cream variety sometimes called the " golden white." In correspondence, J. W. Sinden described the result of a cooking test as follows:

> " The colour was not noticeable on the exterior of the mushrooms, but when they were cut and cooked they became light yellow, while the odour and flavour of the cooked mushrooms was suggestive of chlorine."

EFFECT ON YIELD

Observations and experiments indicate that chlorinated water has no detrimental effect on yields when it is applied at the time of the first " flush " of mushrooms or thereafter. Occasionally, however, when beds are watered early with chlorinated water, there is a yield reduction of 10 or 15%, similar to that which we have sometimes noted when zineb is drenched into the soil at casing time.

The results of an experiment designed to test the effect on the yield of mushrooms of calcium hypochlorite vs. sodium hypochlorite, low chlorine vs. high chlorine, and early application vs. late application are shown in Table 2. The yields shown in the table are the means from six replicate trays prepared as described in the discussion of experimental methods. An analysis of variance indicates that the reduction in yield due to early application (at casing time) and high level of chlorine (200 p.p.m.) are highly significant but the effects of the sodium vs. calcium salts of hypochlorite and the interactions are not significant.

We are inclined to explain the yield reduction from early application on the basis of an hypothesis that chlorinated water is slightly toxic to growing mushroom mycelium but not to the mushroom caps or to the thick strands which form in the soil just previous to fruiting.

For practical purposes, all that is necessary to insure against yield reduction seems to be to avoid excessive chlorination and to delay adding hypochlorite to the water until the first mushrooms appear. Since first " flushes " are usually comparatively free from disease, this delay should not affect the disease control programme.

Table 2. The effect on mushroom yields of different times of application and levels of calcium hypochlorite and sodium hypochlorite in solution

Chemical	Available chlorine in parts per million	Yields in pounds per square foot when first applied at: Casing	1st Flush
Calcium hypochlorite ..	100	3·6	3·9
,, ,,	200	3·3	3·8
Sodium hypochlorite ..	100	3·5	3·9
,, ,, ...	200	3·2	3·8
Control	None	3.8	

L.S.D. 1%=.3 5%=.2

HEALTH HAZARDS

Two questions are frequently asked regarding the risks from using chlorinated water: Is there a possibility of harm from human consumption of treated mushrooms? Will workmen be adversely affected by chlorine gas emerging from treated beds?

Inquiries made in the U.S. Public Health Service and the Food and Drug Administration indicate that there can be no harmful effects on the consumer from applying chlorinated water to mushrooms. For this reason no restrictions are anticipated.

The question of the hazard to workmen in the mushroom houses was raised with the Pennsylvania Bureau of Industrial Hygiene. Tests were made by this agency in commercial mushroom houses to determine the concentration of chlorine in the air shortly after chlorinated water has been applied to the beds. W. H. Taylor (8) summarized the results of these tests as follows: "Atmospheric samples taken during the wetting of the mushroom beds (with chlorinated water) and again 20 minutes after, failed to reveal any trace amounts of chlorine in any of the work atmosphere tested. It is not believed that the practice of using the chlorinated water on the mushroom beds will present any health hazard from the standpoint of inhalation of chlorine gas."

It may be of interest to note here that the inhalation and assimilation of traces of chlorine gas on successive days is not an accumulative process analogous to that of lead poisoning or silicosis. Therefore, repeated exposure would not constitute a special hazard.

METHODS OF PREPARING AND APPLYING CHLORINATED WATER

In large cities water is chlorinated by metering chlorine directly into the water mains from cylinders of liquid chlorine. Because of the danger of handling pure chlorine gas and the high cost of the chlorinators, it probably will not be feasible for most mushroom growers to install this type of equipment.

The most feasible method of chlorination would seem to be simply the addition of calcium hypochlorite (bleaching powder) or sodium hypochlorite to the water in a large tank or a 50 gallon drum. This method is widely employed in small municipalities for treating drinking water; also for chlorinating water used in small swimming pools, and for disinfecting utensils in dairies and food processing establishments. Stabilized hypochlorites are especially packaged for this purpose under several proprietary names in containers varying in size from 1 pound to 100 pound drums. Directions usually are given on the package label for making up concentrations of available chlorine in the range desired. Each grower must choose for himself whether his requirements can best be met by making up the desired strength of solution in large tanks and pumping it directly into the watering line or by making up a concentrated solution and metering it into the water line to obtain the required strength. In any case the water applied to beds should be tested occasionally to make sure that the solution is the desired strength (usually 100 p.p.m). Chlorine test papers are available which provide an inexpensive, rapid and convenient means of making approximate determinations in this range. If the practice of using chlorinated water should become widespread, spawn makers and dealers in mushroom supplies will no doubt soon be in a position to furnish the necessary supplies or furnish the names and addresses of dealers in these supplies.

DISCUSSION

In our opinion the experiments described above and the experience of many mushroom growers justify recommending extensive trials with chlorinated water in commercial mushroom houses. Of course in the long run each grower must decide for himself whether, under his growing conditions, the gain from using chlorinated water outweighs the trouble and expense of applying it. It is not a "cure all" and cannot be expected to eliminate the need for sterilizing the soil or fumigating empty mushroom houses. To assure optimum results the concentration of available chlorine should be held within the recommended limits (50 to 200 p.p.m.) and the solution should not be applied until after the mushrooms begin to form on the bed.

When these requirements are met chlorinated water has several points in its favour as a disease control agent: (1) It is effective both as a bactericide and a fungicide, yet does not discolour the mushrooms, affect their flavour, or reduce yields. (2) It leaves no residue on the mushrooms toxic to the consumer. (3) It leaves no toxic residue in the soil. (4) There is no health hazard to the workmen applying it. (5) It retards the organisms causing bacterial blotch, soft rot of pinheads, *Verticillium*, bubbles diseases, and bacterial pit. The combined net result is to delay the appearance of significant numbers of diseased mushrooms on the bed. This increases the number of flushes during which most of the crop consists of top grade, unblemished mushrooms.

Chlorinated water and zineb are about equally effective in controlling *Verticillium* and *Mycogone*. Therefore, the question is frequently raised as to whether dusting with zineb can be discontinued when using chlorinated water. In our opinion dusting with zineb can probably

be safely omitted in the average house during the winter months. But in damp caves and in mushroom houses in the late spring, it probably will be advantageous to apply both zineb and chlorinated water.

The principal limitation of chlorinated water lies in the fact that it is decidedly less effective under damp conditions when the moisture content of the soil is high and very little water is required. Under these circumstances the high water content of the soil may dilute the level of available chlorine to a point below the minimum for effective disease control.

An excellent review of the literature on chlorination of drinking water and detailed studies of the factors affecting the germicidal efficiency of hypochlorite solutions may be found in the paper of Rudolph and Levine (6).

Literature Cited:

1. American Public Health Association. 1936. Standard methods for the examination of water and sewage. Ed. VIII. New York, N.Y.
2. Anonymous. 1952. Les ennemis du champignon de couche. *Bulletin de la Federation Nationale des Syndicats Agricoles des Cultivateurs de Champignons.* 26: 935-947.
3. DARLINGTON, W. & SONS LTD. 1955. Chlorinated water. *Mushroom News.* 5 (4): 79.
4. BULLOCH, McG. 1950. A new mushroom disease. *MGA Bull.* 18: 24.
5. MOLINAS, A. 1954. Spain's mushroom industry. *MGA Bull.* 51: 100-102.
6. RUDOLPH, A. S. and M. LEVINE. 1941. Factors affecting the germicidal efficiency of hypochlorite solutions. Iowa State College. *Engineering Experiment Station Bull.* 150: 1-43.
7. SINDEN, J. W. and E. HAUSER. 1953. Nature and control of three mildew diseases of mushrooms in America. *Mushroom Science II:* 177-181.
8. TAYLOR, W. H. 1954. Report of investigation of chlorine in mushroom growing establishments, Kennett Square, Pa. Dept. of Health, Bureau of Industrial Hygiene, Commonwealth of Pennsylvania.
9. WOOD, F. C. 1950. Bacterial rot and weeping disease of the cultivated mushroom. *Mushroom News* 3 (2): 23-27.
10. WOOD, F. C. 1951. Some organisms associated with bacterial pit disease of cultivated mushrooms. *Mushroom News* 3(4): 67-72.

Publicity Contributions, Oct. & Nov.

	£	s.	d.
*C. Snowdon & Co. Ltd., Salesmen, Sheffield	1	14	9
*C. Snowdon & Co. Ltd., Salesmen, Sheffield	1	14	3
*Jackson & Ladkin Ltd., Salesman, Nottingham		15	6
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Broadham Produce Co. Ltd., Oxted, Surrey	4	0	0
*Wm. Artindale & Son Ltd., Salesmen, Sheffield	26	8	6
†*S. A. F. Sampson Ltd., Spawn Merchant, Oving, Sussex			
†*Farmers' & Growers' Industries, Sundriesmen, West Worthing, Sussex			

*Previous contributions already acknowledged

†Contributions by spawn merchants are not for publication

AN AMERICAN GROWER'S DIARY

By JOSEPH M. MICHAELS, Naperville, Illinois

8th September, 1955

The following article appeared to-day on the front pages of the American press:

Test Mushrooms In Cancer Control

EAST LANSING, Mich.—(AP)—An old folklore story says that eating certain kinds of mushrooms may help prevent cancer.

Now, a scientist who became curious about it said that extracts from some mushrooms do indeed show ability to retard or stop the growth of some cancers transplanted into mice.

These extracts are not yet pure enough for human tests, to disprove or prove the old story. They may provide a new clue for cancer control.

* * *

The Scientific research into the old wives' tale was described by Dr. E. H. Lucas of Michigan State University at the opening of the annual meeting of the American Institute of Biological Sciences.

Dr. Lucas became interested in the idea after hearing stories that in some Central European countries people eating a certain species of mushroom, named *Boletus edulis*, had very little cancer.

I have asked Dr. Lucas for a copy of his paper so that it could be published in the MGA Bulletin. Much has been done by mycologists on the enzymes and protein metabolism in the cultivated mushroom. Why should physiological processes be different in *Boletus edulis* from the physiological processes of the mushroom that we grow?

I suggested to Dr. Lucas that commercial mushroom growers probably eat more mushrooms than anybody else in the world. (What else could they do with the mushrooms?) The names and addresses of growers in every part of the world are available. A questionnaire filled by the family physician of the various growers could statistically answer the question: what is the incidence of cancer amongst mushroom growers and their families? Is it less prevalent; or is it perhaps non-existent?

The implications for the mushroom business are tremendous. Such publicity would appear on every front page of every newspaper. And even if the incidence of cancer among the growers is the same as elsewhere, many more people will begin to eat mushrooms—just in case.

Ribo-nucleic acid is an important physiological substance in the reproduction of bacteria such as may inhabit a mushroom compost.

Could it be that the mushroom mycelium as it is attacking the compost and competing with bacteria for the available food is producing an enzyme that checks ribo-nucleic acid and thus the mycelium checks bacterial reproduction? (Pssst! Mr. Atkins—biological control).

The onset of cancer in humans, researchers tell, is preceded by a tremendous increase in ribo-nucleic acid. I know nothing about cancer; I can't even begin to fathom this great problem; but with true humility I wonder if the answer could not be partially found, at least, in the complex ecology of a mushroom bed.

The Chicago mushroom growers are wondering when ' lip-stick ' mould will become an important problem in our mushroom houses as it is in the Kennett Square area some nine hundred miles away. The older growers in this area will tell that ' Mat ' disease was non-existent here ten years ago; yet it was causing one crop loss after another in Kennett Square. Perhaps the local growers were late in identifying this parasitic invader. It may seem presumptuous and unfair but local growers do believe that parasitic diseases are spawn borne. The manuals on mushroom culture in use here are unanimous in concluding that practically all diseases originate or have originated in the casing soil. Of course there is no doubt where the diseases come from once a spore load has been established in a growing area. It is never admitted in the manuals that any disease could possibly be spawn borne. The manuals are unfailingly excellent in their approach to practical growing problems. They are published by our spawn makers.

The Kennett Square area is the most congested mushroom growing area in the world. Mushroom houses dot the landscape wherever one may look. It is an unending pattern of mushroom houses, compost piles, and scattered spent manure. Along the Baltimore Pike through this region the used and often disease laden mushroom manure is dumped indiscriminately in every vacant place. Fresh manure is carted through this thoroughfare, while the drying winds blow the airborne diseases. Both clean and disease laden houses are ventilated into this cauldron. What a prodigious job it must be to maintain a disease free crop in this area! Nevertheless, there are many growers who grow excellent crops in this difficult environment.

Nestled in this contaminated Kennett Square land are the only important spawnmakers in America. They take extraordinary precautions to make disease free spawn. The air is filtered and sterilized and every sanitary precaution is practised. But the spawn cannot be hermetically sealed from the outside world indefinitely. At the Railway station, sterile and ventilated spawn cartons are as often as not placed next to ventilated mushroom baskets that contain mushrooms with Bacterial diseases, *Verticillium*, etc. What a beautiful solution to the basic tenet of parasitology: in order for a parasite to live and disseminate itself it must be able to transfer itself from one host to another host. It is interesting to note that a parasite very often has only one

species for a host and cannot survive even in a most closely related species. Parasitologists call this—*host specificity*.

To be practical, may I ask, how does a parasite (like *Myceliophthora lutea* that causes 'Mat' disease) which requires a specific host (like the cultivated mushroom) exist in a soil that might unwittingly become a casing soil in a new mushroom growing area? There are thousands of square miles of soil; must that few square feet that a grower may choose to case his beds, be it in a new area, contain the parasites of a mushroom that is not even indigenous there? Could it be reasonable that some diseases have a common vector and carrier, namely the spawn maker and his spawn?

And how simple the solution is! A cardinal rule of the seed growing business is: do not grow a seed crop in a cropping area. How did our spawn makers overlook this important rule?

"Lb. Per Sq. Ft. is so Misleading" by E. Palfrey, in the August, 1955, Bulletin, is so misleading, I think. For example:

The 2-pounder had 3 crops p.a. = 6 lb. per sq. ft. per annum.

The $1\frac{3}{4}$ pounder had $3\frac{1}{2}$ crops p.a. = 6 and one-eight lb. per sq. ft. per annum.

And who will refill half of his growing space one more time per year to get an additional one-eight lb. per sq. foot? I would rather take a vacation for that time.

The MRA cheque for £1,105 being presented by Fred. C. Atkins (Chairman, Mushroom Research Association) to Mr. T. Ainslie Robertson. (See opp. page).

OVER £1,000 TO FURTHER MUSHROOM RESEARCH

MRA Cheque Presented

The final chapter in the inspired work of the Mushroom Research Association which functioned at Yaxley, Peterborough, from 1946 to September, 1954, came to an end at The Connaught Rooms, London, on Wednesday, 9th November, when, following a meeting of the Board of Directors which in turn was followed by a luncheon, Mr. Fred. C. Atkins, Chairman of the MRA Board, handed over a cheque for £1,105 to Mr. T. Ainslie Robertson, Chairman of the Glasshouse Crops Research Institute, Littlehampton, to further the work of mushroom research.

This without any doubt at all was, from the mushroom growers' point of view, a sad occasion for it marked the end of an individual effort boldly conceived in the first place and splendidly carried out for a time. It is beyond question that the industry, with this experiment, set a fine example to other branches of horticulture and it was no fault of the small but enthusiastic pioneers that the venture, launched and sustained on a voluntary subscription basis, finally came to an end through lack of support.

In presenting the cheque to Mr. Ainslie Robertson, Mr. Atkins said:—

I joined Noble Mushrooms almost 20 years ago. I knew absolutely nothing about mushrooms, and so began a joyful apprenticeship which continues to this day. But it was truly frightening to discover very early on that no one else knew a great deal and that what little research there was was piecemeal, unco-ordinated and quite inadequate.

I was not alone in my anxiety, and after the war four like-minded persons and I formed the Midlands Group, out of whose deliberations sprang the Growers' Association, its monthly Bulletin, and the Yaxley Research Station. A modest attempt at some fundamental research was made at Yaxley under Dr. Ronald Edwards, mainly financed by growers who in their hearts would have preferred something more easily comprehended, with the emphasis on *ad hoc* short-term experimentation of an empirical nature.

Our enthusiasm stimulated half-a-dozen other countries to follow our example—but 1955, the most difficult year I remember, finds us without any research at all.

How did this happen? Two years ago an agreed statement was published to the effect that " facilities at Yaxley shall continue to be used until buildings suitable for mushroom research are erected at Littlehampton." What went wrong was the estimation of the time it would take to build the new mushroom experiment houses.

For more than 12 months now we have been looking to Littlehampton, hopefully but with increasing impatience, for the resumption of our research programme, and I am very glad that Mr. Ainslie Robertson, Chairman of the Littlehampton Board of Management, is

with us to explain the delays and to lift up our hearts with a glimpse of the future.

I am also delighted that Mr. R. A. Hughes, of the Ministry of Agriculture, etc., has been able to come along. He has been a true friend in influential if not exactly luxurious circles.

What the Mushroom Industry desperately needs is fundamental and applied research over a very wide field of problems which are making mushroom growing nowadays **a nightmare confusion of science and tradition, theory and instinct.** We are all so busy passing the ball across this field that we seem to make no progress towards the goal.

Over £25,000 was subscribed to demonstrate that our need for research was genuine. When we heard that Littlehampton would take over future responsibility for this research we closed down on an agreed date, hoping that, in the scale of priorities, **proper regard would be paid to the economic importance of the Mushroom, now second only to the Tomato among the crops to be studied there.**

We transferred to the new Institute about £1,500-worth of equipment and our mushroom-experienced technical staff. This morning the MRA has been legally liquidated, and this afternoon, before *rigor mortis* sets in, I hand over to Mr. Robertson, with the Mushroom Industry's prayers, the balance of our funds, amounting to £1,105.

Accepting the cheque, Mr. Robertson said he fully realised the feeling of anxiety which existed amongst growers, but the new station must be given reasonable time to settle down and produce results. As far as possible the work of mushroom research would be undertaken in a unit similar to the growers' establishment. He himself would do all he could to see that the mushroom industry had its fair share of research.

A vote of thanks to Mr. Atkins "for all he has done in so many ways for mushroom growers" was moved by Mr. Arthur Hovell, former chairman of the MGA and the Worthing and West Sussex Growers. "Without Fred. Atkins there would have been no Research Association," he said, "and I doubt if there would have been an MGA."

Fred. C. Atkins gives advance news of . . .

THE PARIS CONFERENCE, 1956

Thursday, 14th June, 1956, is the date now being considered for the Opening of the Third International Conference on Mushroom Science. It is hoped that the fine UNESCO building in Paris will be available.

The provisional programme under consideration by the French Federation's Organising Committee (*Secretary:* Monsieur P. Dekeirel, 7 bis, rue du Louvre, Paris) is as follows:

Thursday, 14th June: Reception of delegates and opening speeches; Banquet at midday; afternoon visit to the new Mushroom Experiment Station at Montesson, where an exhibition of special interest will be staged.

Friday and Saturday, 15th and 16th June: Practical papers and

discussion on problems of growing, pests and diseases. On the Saturday evening a tour of "Paris by Night."

Sunday, 17th June: Free day.

Monday and Tuesday, 18th and 19th June: Papers and discussion primarily for scientists and research workers.

Wednesday, 20th June: Completion of studies of scientific aspects in the morning; concluding report, discussion and resolutions in the afternoon.

Thursday and Friday, 21st and 22nd June: Excursion to the beautiful Valley of the Loire, the chateaux country where many mushroom growers also make wine.

Saturday, 23rd June: Closing Banquet in Paris.

I have no doubt that many growers in Great Britain will wish to attend this Conference, for it can scarcely fail to be useful, interesting and enjoyable. But there is no need at the moment to do more than make a note of the dates in diaries. You will all be kept fully informed through the *MGA Bulletin*, and in due course you will be invited to take advantage of the special hotel arrangements which the French are making and of the London-to-Paris transport plans which Mr. Alderton will undertake on our behalf as soon as the dates are definitely fixed next month.

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I have been asked . . . . . .

ABOUT MAKING SYNTHETIC COMPOST

By R. L. EDWARDS

The MRA formula for a synthetic compost was published in 1950, and has been in commercial use for five years. In spite of this many growers do not seem to know much about it, and I often hear them say, " I should like to try it," as though it were something particularly difficult. On the contrary it is no more difficult to make a good compost using the MRA formula than it is with horse manure. Special arrangements must be made for wetting the straw but apart from this the method does not involve anything unusual. Baled wheat straw should be used and it may be either threshed or combined. It is very important to have it properly wet before stacking, and this is not as easy as it may sound.

Our method at the Research Station was to lay a drip pipe over a row of bales and drip water on them slowly for several days. The pipe has $\frac{1}{8}$ inch holes drilled every 4 inches along its upper surface, and is carefully levelled on wedges or slung from overhead supports. When the water is turned on, the pipe fills up and overflows evenly through all the holes, giving a slow drip on to the row of bales. These may be stacked three or four high, the length and number of rows depending on the quantity of compost to be made. One drip pipe can be used for several rows of bales if it is moved from one to another. One disadvantage of this method is that a lot of water runs to waste unless provision is made for collecting it in a sump and pumping it back. Another is that the drip pipe may freeze up in winter unless it is suitably protected.

Water can be saved by collecting the run-off and pumping it back either through the drip pipe alternately with fresh water, through a separate system covering the whole of the straw, or through a smaller movable spray which can be directed on to each part of the straw in turn. The wetting is more efficient if the bales to be wetted are enclosed in a building, which also gives protection against frost, or by fixed or temporary walls or dry bales of straw, which prevent drying of the outside of the straw and also help to retain some of the heat produced in the wet straw.

For really efficient wetting a system of overhead spray nozzles should be used to cover the whole batch of bales, and should be supplied by a pump of sufficient output and working pressure to produce a fine spray from all the nozzles at once. The size of pump required can be worked out according to the number, size and type of nozzles used, which in turn depends on the quantity of straw to be wetted. The straw should stand on a concrete floor draining off to a sump from which the water is pumped, and the water level in the sump should be maintained by a ball tap. The supply of fresh water can be metered if desired as a check on the amount used in relation to the quantity of straw. In this way the wetting process is complete and automatic; it may sound complicated but it saves so much trouble that an installation

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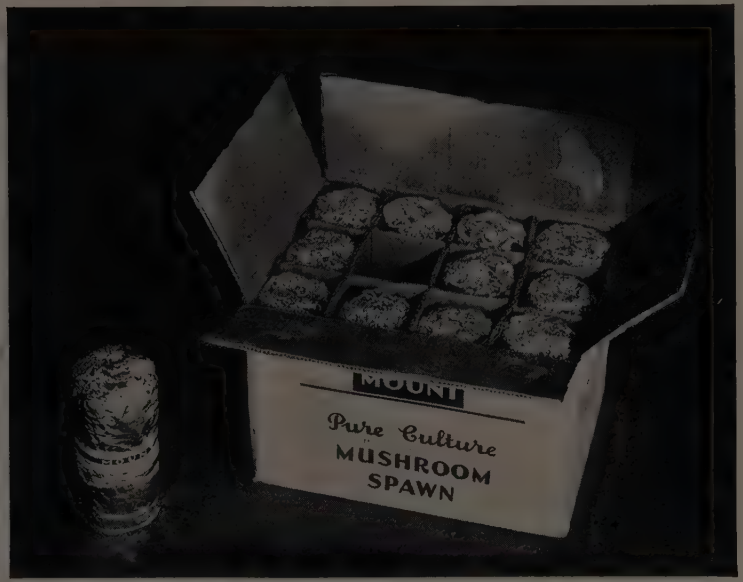

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of this kind is very well worth while. Dr. Sinden recently mentioned the importance of starting with any kind of compost thoroughly wet, and that certainly applies to the straw for synthetic compost. Some protection against frost is necessary in winter. The best thing is to put the whole installation in a suitable building, but less costly methods can be used if the pipes are drained off at night during frost, an extra day or two being allowed for wetting. The wet straw soon starts to warm up and the water running back into the sump may become quite warm.

Naturally if the whole installation is in the open, freezing must be expected, and in that case there may be periods up to several weeks in winter when composts cannot be started.

Having been thoroughly wetted, the bales are cut open, and the straw is stacked in layers, each layer being sprinkled with Activator and well trodden. At this stage it is impossible to make the stack too tight. The straw is usually put through a chopping machine before stacking, to cut it into pieces less than a foot long, but some of the turning machines now in use cut it short enough in the course of three or four turns without preliminary chopping. The quantities of straw and Activator must be controlled, most conveniently by working out the average dry weight of a bale and adding the correct proportion of Activator after each bale has been added to the stack. The Activator can be measured by bucket after a few buckets full have been weighed; it is not necessary to continue weighing every bucket, but it is advisable to check the Activator against the number of bales after every few bags of Activator, or every 20 or so bales, to guard against a slow drift in the fullness of the bucket. A record should be kept of the quantities of straw and Activator used.

The stack should be surrounded by dry bales of straw to protect it from draughts and to reduce the thickness of the cool dry layer round the outside. It may be any width from about 6 ft. to 10 ft., up to 6 ft. high at stacking, though it will settle a foot or more before the first turn, and any length, depending on the quantity of straw.

The standard MRA Activator is based on dried blood as source of nitrogen and this formula is very firmly established by several years of commercial use, as capable of giving excellent yields. The Activator is available mixed ready for use from several firms who advertise in the MGA Bulletin.

There are two alternatives which are based on work at Yaxley. Urea was used in experiments there and gave results as good as those with dried blood. For some years it was not on the market as all available supplies were required for manufacturing plastics, but limited amounts are now on sale, and it is also being made up in a mixed Activator. The main disadvantage of using Urea is the strong smell of ammonia at the first turn which can make work on the stack very unpleasant, particularly in a confined space. There are various possibilities for overcoming this difficulty but it remains to be seen whether any of them will be successful. Urea—dried blood mixtures can also be used, and in this case the smell of ammonia is reduced.

The other alternative is a new Activator based on sterile activated sewage sludge. This was not used at Yaxley but has given good yields in some trials on commercial farms. It is stated to follow the MRA formula except that the sludge product replaces dried blood. Both in this and in the Urea formulations the quantities used are calculated according to nitrogen content so that the total nitrogen supplied per ton of straw is the same whether blood, urea or sludge is used. This also means that the amount of Activator per ton of straw is different in each case, and the supplier's directions must be followed. The stack should heat up in about two days, and is usually turned at weekly intervals if the original composting time of four weeks is adopted. Under good conditions, probably depending mainly on the initial preparation of the straw, this period may be reduced to three weeks or an intermediate period, and in this case the intervals after the first and later turns may be shortened. In all cases the behaviour of the stack must be the deciding factor and it must not be turned or filled according to a time table if for any reason it is not ready. From this stage onwards the compost is treated in the same way as horse manure.

The advantages of the synthetic compost are that the materials can be stored and a compost can be started on any desired day, regardless of deliveries; given adequate labour the stack can be made in one day, whereas delivery of enough manure for a house is sometimes spread over two or more days; even one day's deliveries may represent the accumulation of several days. With these features and a really effective straw wetting system, a higher degree of uniformity of compost is possible than can usually be relied on with horse manure.

There is no advantage over horse manure in freedom from pests and disease, nor in cost if dried blood is used, though urea brings the cost down to compare favourably with manure.

Nor does synthetic compost make mushroom growing in general very much easier; the same skill is needed at all stages to judge the condition of compost, watering, ventilation and so on.

The MGA and Research

The MGA Executive has set up a Research Sub-Committee which will act *inter alia* as the Mushroom Sub-Committee of the Littlehampton Glasshouse Crops Research Institute. Mr. Fred. C. Atkins is Chairman, with Messrs. Raymond Thompson, A. DeB. Hovell, H. H. Glasscock and B. D. Moreton.

Sorry!

We apologise for the fact that in the Brighton Competition Results on Pages 857-8 we three times mis-spelt Linfield Nurseries Ltd., omitting the D in Lindfield.—EDITOR.


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THE CAVES OF AGARIC LTD.

Over 70 people attended a farm walk at the extensive caves of Messrs. Agaric Ltd., at Bradford-on-Avon, Wilts., on Saturday, 29th October. For many it was a particularly long journey and everyone agreed that the visit held more than the ordinary interest in that, for the majority, it was their first close up inspection of mushroom growing in caves.

Agaric Ltd., have been growing mushrooms in disused limestone caves at Bradford-on-Avon since 1914, and are probably the oldest established mushroom growing firm in the country. It is not surprising therefore that under the direction of Mr. S. J. Pointing, Managing Director, they have brought mushroom growing under these conditions to a fine art.

For this visit there was a fine display of mushrooms, brown and white, all growing on ridge beds on the floor of the mine workings. Whilst it is probably true that the novelty angle of a visit to caves such as this added much to the interest of the occasion the visitors were equally impressed by the splendid showing of mushrooms, both in numbers and in quality. Growing temperature remains at about 55 degrees and each of the four caves is given a rest of a year between each crop. Under these conditions the beds crop themselves right out and,

Members of the MGA Executive Committee had a morning tour of one of the caves of Agaric Ltd., prior to the afternoon farm walk. On the left of the picture are Mrs. Lawrence, Mrs. A. G. Pointing and Mrs. Bleazard. Mr. Pointing is on the right (with hat) and Mr. G. W. Baker (MGA Chairman) on the extreme right.

in between crops the caves are thoroughly washed out with disinfectant. As Mr. Pointing explained, little or no serious disease develops. Watering is carried out by individual cans and, with the electric light installations suffering considerably from corrosion, small acetylene lamps are carried by the workmen. These same lamps were carried by the visitors and cast a somewhat eerie light on the surroundings.

Agaric prepare their compost by hand and in 20 ton stacks, turned four times.

Horse manure is used in conjunction with blood and organic activators.

Peak heating and spawning takes place above ground before the compost is transferred to the nearby caves.

After the walk Mr. Pointing entertained the entire company to tea over which Mr. G. W. Baker (Chairman of the MGA) presided. Many questions were afterwards asked and answered including one on casing, Mr. Pointing explaining that he used a mixture of peat, sand and ashes.

Thanks to Mr. and Mrs. Pointing were expressed by Mr. F. Bleazard (Lancs.).

On Friday evening, Mr. and Mrs. Pointing entertained members of the Executive Committee to dinner in Bath, and, on Saturday morning, there was a special visit to the caves, followed by lunch at Bradford-on-Avon, which Mr. and Mrs. Pointing again kindly provided.

PINHEADS

23. A well-known figure in the Industry who was driving home one night, doubtless concentrating too hard on the latest cultural problem, failed to avoid making contact with a stray sheep. This, to the unhurt sheep's obvious amusement, reduced his radiator grille to scrap. His solicitor, looking into the possibilities of compensation, wrote: "No successful claim against the farmer would appear to be possible in the absence of any proof of any mischievous intention on the part of the animal concerned."

24. There are large cecids, mainly seen on the stems and gills, and small ones (presumably offspring) which appear to come out from the base of the compost on to the projecting edges of our concrete beds after a watering. At first we thought the latter were being washed down from the casing surface via the gap between the compost and side board, but in an unwatered house we played a little water on to the concrete edge and allowed it to run under the compost. Within hours masses of small cecids "swam" out. As the water dries off the cement the cecids tend to run together into small seething balls, possibly to retain some skin moisture. Later, as these balls dry out, the cecids die. It seems certain that all cecids like moisture but this doesn't give any clue to their control, as the necessary degree of dryness to kill them would reduce the mushroom crop to nil.

25. I have frequently noticed that any small mushrooms left in a house which is due for emptying and has been sprayed with formalin, grow rapidly and assume immense proportions, with dazzling cap patterns. This leads me to wonder if a mild dose of formalin during cropping might have a stimulant effect, with a possible improvement in yield.

26. Clever men tell me that Sinden's short composting is easy, simple and sure. Out of six attempts at it I haven't had one crop that hasn't been well below my average. This is no reflection on the method, but on my own ability—which I freely acknowledge. Simple as it is I just can't find the knack. There is an exact parallel in the "solid square to small triangle" system of our own at Brayton, claimed by us to be simple, but which if my information is correct has been responsible of putting more growers out of business than the combined efforts of La France, the Worthing phorid, and a "drift" of Scientists.

27. After the death of the firm's mascot—a useful terrier—our rat population increased and lived happily by scarrifying our beds to get at the grains of spawn. One day we put down several trays of Murphex Warfarin Bait under the bottom beds. By the following morning some of them had been completely covered over with stray bits of compost from the floors or beds. We had the same experience once before when some of the same bait was placed in trays in our dwelling house attic. In this case the Warfarin grain was completely covered with pieces of ceiling plaster up to the size of a walnut. Just to make this Pinhead worth reading I must say the rats left the attic, and they seem also to have vacated our mushroom houses.

28. What folly is this! I am at a loss to understand the advertising stunt of one of the compost activator merchants. To support his case his circular enclosures include the views of a certain prolific writer who suggests that composting may be a waste of time (and ammonia) and that this firm's product, wisely used, may be a substitute. But the advert matter makes it clear that no tests have been concluded to back up the statement and goes on to suggest, by inference, that growers might like to try it. One man has a mad-cap idea, untried, untested, and a responsible firm of activator suppliers seriously expects us to have a go. Come, come, Mr. Barrow. Mushroom growers are not as green as that compost would be!

29. By a process of evolution our 26,000 sq. ft. farm is gradually becoming a Commercial Experimental Station. (Private, I would add—not public!). Already probably well over 20% of our activities are concerned with experiments which may be grouped under three heads. Class A is a fully-designed, fully-controlled type of test, using anything from 40 to 80 trays of 6 sq. ft. each. All the recognized scientific dodges are employed—blocks, levels, randomization, controls, etc., and all weights are taken to the nearest 1/10 oz., and every mushroom is counted. Results are subjected to statistical analysis. Class B is a commercial scale test of the above results, or of any other idea that might reasonably by-pass Class A, or otherwise produce some indication or clue of value. These B tests take the form of half house v. half house, or house v. house, both having the same compost and general conditions as nearly alike as possible. Such tests are less precise than Class A, but do give a fairer idea of what might happen in commercial practice. Class C tests are the sort that spring from sudden ideas and are put into effect immediately and most unscientifically "just to see what happens." An example of this might be the burning of a spot of dactylium with a blow lamp to observe whether there were any further spread. Or one might give a small clump of pinheads an extra dose of water and get ready to jump!

". . . Just to see what happens."

30. I'm told that Class A experiments (see above) give quicker and more definite results than Class B. It may be so in theory, but there are pitfalls. It seems that these pukka tests have a habit of producing many ideas for further tests upon which they themselves depend. Thus, while you *appear* to have got a satisfactory result you in fact are not quite so sure that it might not have been another way round if you had, for instance, given a different treatment to some parts of the test. For example you may test casings and get certain results. But you don't

know that you wouldn't have found different results if all the casings had had their ideal treatment of water and ventilation. To illustrate the possible confusion let me take a concrete case. Edwards did a " compost depth " test and found that the deeper the compost the higher the yield and the bigger the mushroom. We did a Class B test, with the same compost in two houses; one house 8″ and the other 12″ deep. The 8″ did best in yield and size was not observably different. So we did a Class A test. Tray depths of 4″, 6″, 8″, 10″ and 12″ were used, with compost thoroughly mixed before use, and each tray carefully weighed out pro rata. Result: a progressive increase in both yield and size, bearing out Edwards. That is confusion No. 1. Now, accepting the pukka Class A and ignoring the commercial Class B, one would suppose that greater depth meant more food available, hence higher yield. That's fair enough. But one would also suppose that since greater depth gave bigger mushrooms the reason was again because of more food. Yet in another Class A test on Compost Boosts, with from No Boost, through Normal Boost to three times Normal Boost, the latter with most food produced the highest yield but mushroom size throughout the range was virtually equal. Confusion No. 2. It seems almost dangerous to assume that results from any test, scientific or otherwise, are really reliable, " Mushroom growing," as Dr. Lambert says, " being what it is." I would suggest Class B is the safest bet, as it's the nearest to our way of growing.

31. I wonder if we really know the first thing about the effects of our changeable weather on our composting processes. You may or may not believe the following. A stack started during a recent frosty spell was almost ready for filling on the Friday. It was rapidly turning a lovely chocolate brown with a clean sweet smell. I thought another 24 hours would put it just about right, but it was for a large house that couldn't be filled on a Saturday morning. Late on Friday the weather took a change from frosty to muggily warm. By Sunday morning that compost had turned " green " again and the smell of ammonia had returned. And all this was in very small 100% aerobic triangles. You don't believe it? No, I thought you wouldn't. It's a pity, because there's a clue somewhere if we could find it.

32. Ref. item 19. The address of the O-Clip & Coupling Co. Ltd., is 13 Tottenham Street, Tottenham Court Road, W.1, and not 13 Tottenham Court Road. I'm sorry for the mistake. Nevertheless several enquiries have reached the firm.

33. Surely this paragraph, from the *Daily Telegraph* of 25th October, is of the utmost value: " Members of the Inland Revenue Staff Federation, who collect income tax, have been told that the Board of Inland Revenue will accept no liability if collectors are assaulted when trying to obtain payment of tax arrears."

34. Footnote, addressed to tray growers. Can you increase your production per crop by using deeper Compost? Think well before you reply. No cheating allowed.

LETTER

Sir,

I believe I am not speaking for myself alone when I ask that in future all contributions to the Bulletin be signed. One can understand why the November Pinheads appeared anonymously, but it is not a policy to be encouraged. Yours faithfully,

F. C. ATKINS.

S.M. asks: "What's the difference between an unsigned article and the cryptic ambiguity of 'One can understand . . .'? Are we entitled to know what, if anything, Mr. Atkins does understand?

On the left is STANLEY MIDDLEBROOK, caught in characteristic pose at the cup celebrations after the competition results had been announced at the Brighton Exhibition.

THE MUSHROOM GROWERS' ASSOCIATION

OF GREAT BRITAIN AND NORTHERN IRELAND

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Names in italics are of Associate Members.

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Moeykens, A., Merelbeke.
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Pharmacomin, Peruwelz, Belgium.
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Field, Fredk. E. & Son, Mushroom Farm, Barkham, Wokingham.
Harries, D. J., Cooper's Lime Works, Pinkey's Green, Maidenhead.
Longwood & Culham Nurseries Ltd., Culham, Abingdon.
Simons, D. E., Arborfield, Wantage Road, Didcot.
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Fryer, R. S., Nashleigh House, Chesham.
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Stewart-Wood, J., Aylesbury Mushrooms Ltd., Ford, nr. Aylesbury.

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Slack, C. Irving, Slack Brothers, Waterloo, Quebec.
Tangmere Mushroom Company, R.R.No. 3, Milton, Ontario.

CHANNEL ISLANDS

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Paludan, Professor H., Helsebakken 15, Hellerup.
Petersen, H., Raunshoj, Bregnerod pr. Birkerod.
Rasmussen, C. R., Bagsvardvig, 102, Kgs. Lyngby.
Svendsen, K., Fuglsang, Farum.

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Co. DURHAM

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Walker, H. J., Prospect House, Bowes, Barnard Castle.

EIRE

Allen, R. Ivan, Imokilly Orchards, Shanagarry, Co. Cork.
Carbide Ltd., Collooney, Co. Sligo.
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Dudgeon Bros., Killyleen, Ballinode, Co. Monaghan.
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Meath Packers Ltd., Dunshaughlin, Co. Meath.
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ESSEX

Austin, M. D., The Haven, Woodham Mortimer, Nr. Maldon.
Darlington, R. C., Hastingwood, Harlow.
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Gibbons, J. S., Takeley Nurseries Ltd., Takeley.
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Newman, G. H., "Pantiles," Stane Street, Takeley.
Pan Britannica Industries Ltd., Waltham Abbey.
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Paton, J. Stuart, "Millers," Takeley, Nr. Bishops Stortford.
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Speller, R. L., Hoe Lane, Nazeing.
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Tiptree Manure Co. Ltd., Brook Road, Tiptree.
Triangle Nursery Ltd., Rowney Farm, Harlow.
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Guiochon, P., Mesnil-le-Roy, (S. et O.).
Loyant, Michel, Longué, (M. et L.).
Nail et Fils, Chançay, (Indre et Loire).
Peyronnet, Ets. Barbier, 1 Rue de la Tranchade, Angouleme, Charente.
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Mitchell, F., P.O. Box 13, G.P.O. Cheltenham.
Newland Products Ltd., The Tunnels, Newland, Coleford.
Rowley, J. D., Kingsheath Nurseries, Cribbs Causeway, nr. Bristol.

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Bell, Lt. Col. H. G., Newnham Hill, nr. Basingstoke.
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Dring, J. Ltd., The Airport, Portsmouth.
Fillis, W. J. J., 8 Cavendish Road, Aldershot.
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House, Charles, Haydown House, East Cholderton, Nr. Andover.
Lawrence, Capt. G. P., Barrow Hill, Goodworth Clatford, Andover.
Liphook Mushrooms Ltd., Queen's Road, Griggs Green, Liphook.
Rooke, Dr. A. R., Beechcroft Nursery, Four Marks.
Townsend, H. C., 118 London Road, Cowplain, Portsmouth.
Trusler, W. J., 89 Kite Hill, Kempshott, Basingstoke.
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Warwick, R. G., Wickham.

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Godfrey, P. F., Wanatchee Products, Much Birch, Hereford.
Venour, Lt. Col. W. A., Hom Lodge, Hom Green, Ross-on-Wye.

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Combe, Mrs. L., Scatterdells, Chipperfield.
Cox, J. C. Faringdon, Townsend Farm, Harpenden.
Dean & Speller, Conduit Lane, Hoddesdon.
Driffill, E. J., Tom's Hill House Cottage, Aldbury, Tring.
Goodchild, R. D., Letchworth Nurseries, Works Road, Letchworth.
Hagger, C., The Maples, Melbourn, nr. Royston.
Hall, W., Floral Farm, London Colney.
King, Geo. W. Ltd., Argyle Works, Stevenage.
Knight, J. R., "Dukes," Allen's Green, Sawbridgeworth.
Mawby, W. H., Chara Mone, Old Nazeing Road, Broxbourne.
Monro, Geo. Ltd., Technical Dept., Waltham Cross.
Moore, W. J., 46 High Street, Melbourn, Royston.
Murphy Chemical Co. Ltd., Wheathampstead, nr. St. Albans.
Standard Range & Foundry Co. Ltd., Queens Road, Watford.
Ward, D. E., Tom's Hill House, Aldbury, Tring.
Watson, Angus, The Beehive, Meesden.

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Cumming, D. F., 3 Church Road, Molash, Canterbury.
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Fort Darland Mushroom Farm Ltd., Gillingham.
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Gray, Pannell & Sons, Poplar Nursery, Richborough Road, Sandwich.
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Hall, A., Riversdale, Lyminge.
Harding, Noel D., Inglewood Guest House, St. Michael's, Tenterden.
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Holmes, T. P., Biggin Farm, Challock, Ashford.
Jackson, R. L. O., Park Cottage, Doddington, Sittingbourne.
Leach, T. T., Walford House, Smarden.
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Smith, E., Woodville, Challock,
Smith, E. N., Plantation House, Rhode Common, Faversham.
Smith, G. C., Loddington Farm Ltd., Linton, Maidstone.
Stanford-Tuck, Mrs. J., The Lynch, Eastry.
Stedall, G. St. G., Shearway Nurseries, Cherry Gardens, Folkestone.
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Casswell, Wood (Manchester) Ltd., Smithfield Market, Manchester 4.
Coates, Fred., Rivelin Nurseries, Course Lane, Newburgh, Wigan.
Collins, Gordon, 23 Queen Square, Liverpool 1.
Conroy, P. J. Ltd., Hope Street, Wigan.
Davey, T. W. Ltd., Smithfield Market, Manchester 4.
Faulkner, H., Brent Mead, Firswood Road, Lathom.
Fitzpatrick, P. & T. Ltd., 22 Queen Square, Liverpool 1.
Garner, W. R., Ridgmont Mushrooms, Moss Lane, Hesketh Bank, nr. Preston.
Higgins, William, Ivy Cottage, Moss Lane, Lathom, nr. Ormskirk.
Howlett, T. & Co. Ltd., Strand Buildings, Cleveleys.
Hunt, John, Torr's Farm, Walmer Bridge, nr. Preston.
Kay, Wm. C., Old Brook Hall Farm, Bold, nr. Widnes.
Kaye, Enos, Castlefolds Market, Sheffield 1.
Lewis, David J., Anfield Lodge, 13 Anfield Road, Anfield, Liverpool 4.
Lucas, J. C. & Sons, Castlefolds Market, Sheffield.
Martland, R. G., Burscough Bridge, Ormskirk.
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Redgewell, G. E., 20 Hawksworth Grove, Morecambe.
Rothwell, J. & Son, Little Hall Farm, Cottage Lane, Ormskirk.
Sanderson, Leonard, 15 Oldfield Carr Lane, Hardhorn, Blackpool.
Snowdon, C. & Co. Ltd., Castlefolds Market, Sheffield 1.
Trickett, R., 75 Parkinson Street, Mill Hill, Blackburn.

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Riley, Michael, Riley & Clark Ltd., Lubenham Hill Nurseries, Market Harborough.
Symington, Noel H., Arthingworth Lodge, Market Harborough.

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British Rototherm Co. Ltd., Merton Abbey, S.W.19.
Brockhurst, G. W., 23 Formosa Street, W.9.
Broome & Green Ltd., Covent Garden Market, W.C.2.
Celcure Ltd., Aldwych House, Aldwych, W.C.2.
Cilia, J. C., 56 Inverness Terrace, W.2.
Collingridge, J. Ltd., 36 Wellington Street, Covent Garden, W.C.2.
Cyanamid Products Ltd., Bush House, Aldwych, W.C.2.
Elliott, Thomas Ltd., Eagle Mills, 120 New Church Road, S.E.5.
Filmer, F. L., Union Wharf, Wenlock Road, N.1.
Filmer, R. H. Ltd., Union Wharf, Wenlock Road, N.1.
Flower, Major R. A., c/o Lloyds Bank, Cox & King's Branch, Pall Mall, S.W.1.
Fort Darland (*Mushroom Farm*) *Ltd.*, 35 Piazza Chambers, Covent Garden, W.C.2.
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Knight, L., Brooklyn, Sewardstone, Chingford, E.4.
Lake, S. E., 61 Curzon Street, W.1.
Marion, M., 16 Kings Orchard, S.E.9.
Penny, A. C., 35 King Street, Covent Garden, W.C.2.
Poupart, T. J. Ltd., 110 Long Acre, W.C.2.
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MEXICO

Hongos de Mexico, Madrid, Num. 21-213, Mexico D.F.4.

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Kernohan, S. H., Lower Broughshane, Ballymena.
Lefroy, I., Ferns Hollow, Killaloe, Co. Clare.
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Nelson, R. G., Ballylumin, Ahoghill, Co. Antrim.
Patterson, Robert, Monlough Food Production Co. Ltd., Ballygowan, Belfast.
Young, Mrs. M. B., Mountsandel, Coleraine, Co. Londonderry.

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Pearson, S. & Son, 40 Green Market, Newcastle-on-Tyne 1.

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Knight, W., Arendee, Langney, Eastbourne.
Langford Nursery, Clymping, Littlehampton.
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Lisher, G. A., Brierley, Grinstead Lane, Lancing.
Lower North Barn Nurseries Ltd., 6 Third Avenue, Lancing.
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Dyke, R. A., Indiana Mushroom Corporation, West Terre Haute, Indiana.

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Frezzo, E. & Sons, Toughkenamon, Pa.
Fry, Norman, Walnut Hill Mushrooms Inc., Bettsville, Ohio.
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Green, Jacob M., 1454 Valley Road, Coatesville, Pa.
Green, W. Howard, c/o Concord Foods Inc., Concordville, Pennsylvania.
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Skillman, E. E., Horticultural Experimental Station, Hoddesdon, Herts.
Slater, Sir William, Agricultural Research Council, Cunard Buildings, Regent Street, London, W.1.
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Storey, Dr. I. F., 137 Queen Edith's Way, Cambridge.
Taylor, Dr. R. E., The Homestead, Pebworth, Stratford-on-Avon, Warwicks.
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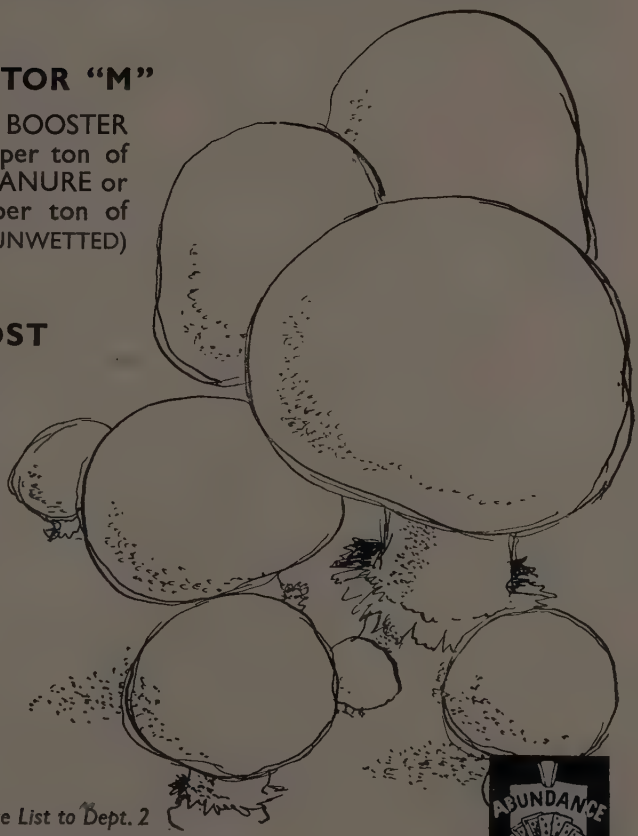

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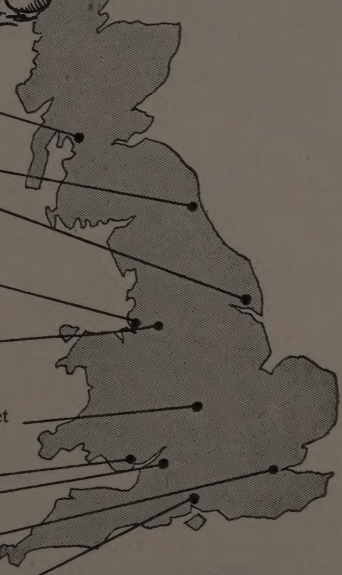

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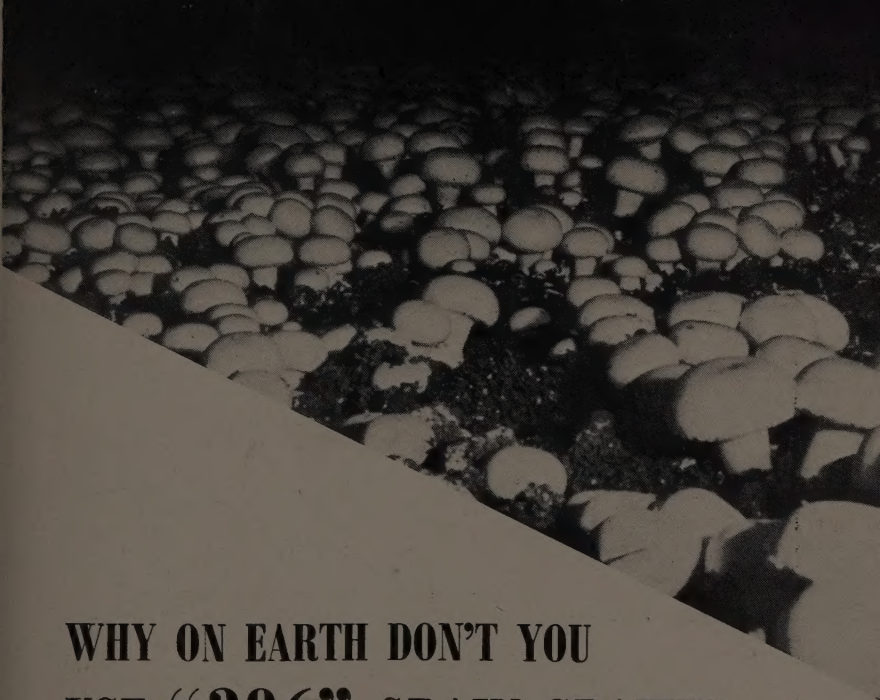

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